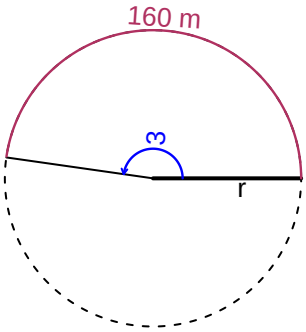
Name: Date:

Trig Final (SLTN v650)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 160 meters. The angle measure is 3 radians. How long is the radius in meters?

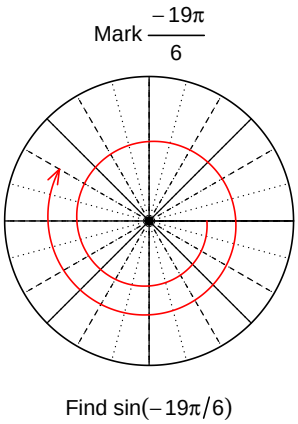


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

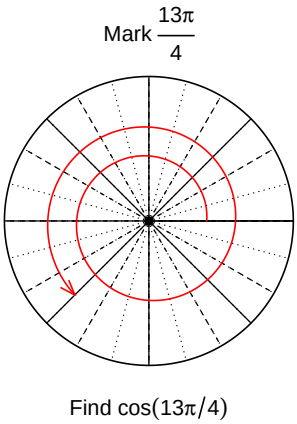
$r = 53.33$ meters.

Question 2

Consider angles $\frac{-19\pi}{6}$ and $\frac{13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-19\pi}{6}\right)$ and $\cos\left(\frac{13\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-19\pi/6)$



Find $\cos(13\pi/4)$

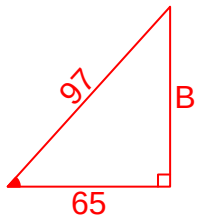
$\sin(-19\pi/6) = \frac{1}{2}$

$\cos(13\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-65}{97}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

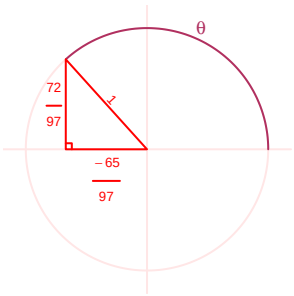
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$65^2 + B^2 = 97^2$$
$$B = \sqrt{97^2 - 65^2}$$
$$B = 72$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{72}{97}}{\frac{-65}{97}} = \frac{-72}{65}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 8.68 meters, a midline at $y = -2.3$ meters, and a frequency of 3.63 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8.68\cos(2\pi 3.63t) - 2.3$$

or

$$y = 8.68\cos(7.26\pi t) - 2.3$$

or

$$y = 8.68\cos(22.81t) - 2.3$$